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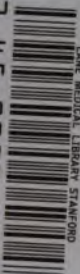
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LINNÆUS AS A PHYSICIAN.*

LUDVIG HEKTOEN, M.D.

CHICAGO.

INTRODUCTION.

Among physician-scientists who achieved their greatest renown in some department of learning other than medicine Carl von Linné, better known as Carolus Linnaeus, must be placed in the front rank. This great naturalist made for himself a permanent name in medicine also, but the extent and significance of his work and interest in medicine seem to have been more or less overshadowed by the fundamental importance of his work in natural science, especially botany.

The principal sources of the information in this article have been Richard Pultney's excellent work on the writings of Linnaeus,† in which the medical writings also are fully considered, and Hjelt's special work concerning Linnaeus as a physician,‡ based upon personal study of the writings and correspondence of Linnaeus and of the records in the archives of the University of Upsala. Both these books appear to give altogether thorough and sympathetic reviews of Linnaeus' medical activity in its various aspects as teacher, investigator and writer.

* Read before the Scandinavian Medical Society of Chicago, May 20, 1902.

† Richard Pultney, M.D., F.R.S., "A General View of the Writings of Linnaeus." Second edition, with corrections, considerable additions, and memoir of the author by William George Maton, M.D., etc. London, 1805. With translation of Linnaeus' diary.

‡ Otto E. A. Hjelt, Carl von Linné som Läkare och hans Betydelse för den medicinska Vetenskapen i Sverige. Helsingfors, 1877.

OUTLINE OF THE CAREER OF LINNÆUS.

Born in 1707, Carl von Linné was destined by his father for holy orders, but showed such distaste for scholastic studies and such desires to ramble in search of plants and flowers that his father was urged to apprentice him to a tailor or shoemaker. Through the kind efforts of a physician Linnæus was encouraged in his study of plants and of physiology, and eventually admitted to the University of Lund with a testimonial of the following dubious import: "Youth at school might be compared to shrubs in a garden which may disappoint the gardener, but if transplanted into different soil they may prosper." It was hoped that in the university the conditions might be more propitious for his progress.

As a student Linnæus assisted in private practice. At that time there was no real clinical instruction in Sweden, and it was customary for the young men to work under preceptors ("frequentera sjukstugan och lära av den svidandes egna mun"). When Linnæus came to Upsala in 1729 the medical faculty consisted of two professors and one adjunct. One professor taught pathology, dietetics, surgery, pharmacy; the other physic, chemistry, anatomy, physiology and botany, each constituting by himself a whole faculty. Olaf Rudbeck, the older, celebrated for his discoveries in the lymphatic system, had founded a botanic garden, but his successor, his son (1660-1740), though a good botanist, neglected botany for comparative philology and antiquarianism. In 1730 Linnæus had advanced so far in the esteem of his teachers that he was given a stipend and began to lecture on botany, with such success that intrigues were started against him and his docentship taken away. Advised by friends, Linnæus went to Harderwick, in Holland, where he obtained his degree in 1735, the title of his dissertation being "Hypothesis nova de febrium intermittentium causa." This thesis was founded principally on observations made in Sweden, where it probably was written. He sought, and after waiting eight days, gained admission to the great Boerhaave, then near the end of his illustrious career, but who helped him *much* in his botanical studies. At that time botany *flourished in Holland*, Boerhaave himself being a bot-

anist, and Linnæus' love for botany kept him away from home and his future wife for three years longer. The work he did during this time exercised vast influence on the development of botany, being in reality the starting point of systematic botanical science.

He early became conspicuous in Holland and secured the regard of all that cultivated any branch of medical science, among them being Van Swieten and Lieberkühn. Linnæus reaped the greatest benefit from his close relationship with the illustrious Boerhaave, who showed the young Swedish scientist marked friendship and confidence. The following extract from Linnæus' diary—a curious and interesting document—describes their last meeting: "Before the time of Linnæus intending to leave Leyden, Boerhaave had been attacked with hydrops thoracis, and consequently with great difficulty of respiration; he had, therefore, given orders that no person should be admitted to see or speak to him, for he could not lie down in his bed, but was obliged constantly to sit up. Linnæus was the only person in whose favor exception was made, that he might see him and kiss the hand of his great instructor, to bid him a sorrowful adieu. The venerable invalid had still strength enough left to stretch out his hand, and (putting it to his lips and kissing it in return) to say: 'I have lived my time out, and my days are at an end. I have done everything that was in my power. May God protect thee, with whom this duty remains. What the world required of me it has got, but from thee it expects much more. Farewell, my dear Linnæus!' Tears prevented him from saying more. and, on Linnæus' return to his lodgings, he sent him an elegant copy of his *Chemistry*." And surely Linnæus may be placed by the side of Haller, Van Swieten, De Haen and others as a worthy pupil of a great master.

Greatly honored throughout Europe for his work in botany, so that Sauvages wrote, "the whole botanical world obeys you forever," and having received flattering offers to remain in Holland, and also from Oxford and Paris, Linnæus, in 1738, returned to Sweden and settled in Stockholm. where, after a desolate period of waiting for patients, he achieved his first success through treatment of gonorrhœa. Always afterward he showed much interest in the treatment of gonorrhœa

and syphilis. He became naval physician and utilized his opportunities to study diseases and the actions of drugs. He also secured permission to make postmortems, heretofore but rarely granted, and Hjelt states that from this time the interest in pathologic anatomy increased in Sweden. In 1739 he married the choice of his heart after an engagement of several years; his practice increased rapidly, but he felt himself irresistibly drawn toward botany and natural science. He was offered a professorship in Göttingen, but in May, 1741, he received appointment as professor in Upsala in spite of a hot fight against him; the following year an adjustment with his colleague, Rosén, gave Linnæus botany and the botanical gardens, and for the succeeding thirty-six years the great botanist was continuously interested more or less in medical problems.

Thenceforward his life was a continuous course of prosperity. He was greatly honored. Botany occupied his special attention in spring and summer; in the autumn and winter months he gave the more purely medical lectures. He gathered about him a larger circle of students and listeners than any one either before or after him has done; the number of students in the university rose from five hundred to fifteen hundred, and he "shifted the scientific center of gravity to a small town in Sweden." Students flocked to hear him from Finland, Norway, Denmark, Germany, Russia, England, and even from America. Adam Kuhn of Philadelphia spent the years 1763-1765 in Upsala as student under Linnæus, who regarded him with special favor. Kuhn, in 1768, became the professor of *materia medica* and botany in the College of Philadelphia, where he gave lectures on *materia medica* for twenty-one years. When the College of Philadelphia, in 1791, united with the University of the State of Pennsylvania to form the University of Pennsylvania, Dr. Kuhn became professor of theory and practice of medicine, continuing as such for six years.

As a general result of Linnæus' influence, the study of the natural sciences received a mighty stimulus in the universities where logical disputations and metaphysical speculations too long had prevailed to the exclusion of science. The culture of natural science in Sweden was carried to a higher standard than elsewhere

in Europe, but his pupils rapidly extended the doctrines and celebrity of their master, and before long numerous public institutions were established elsewhere also for the express cultivation of natural sciences. Linnæus emphasized eloquently the relations and importance of the study of natural history to the welfare of the people, and was ever striving to enlist the interests of the great in behalf of this study and to draw the youth of the land into its paths. In this respect there is great similarity between Linnæus and Pasteur; for Pasteur was irresistibly drawn toward scientific problems connected with industries of large economic importance. Linnæus found special delight in the study of natural science, which he regarded as "one of the richest and most permanent sources of pleasure which the kindness of providence has opened to the human mind." In his labor to arrange anew the history of the productions of nature "he found biology a chaos and left it a cosmos."

LINNÆUS' RELATIONS TO MEDICINE IN GENERAL.

Linnæus was deeply interested in the development of medicine in all its phases. He urged its establishment upon a rational basis of theory and observation. Exact observations of nature and logical grouping of the results are essential for progress, philosophical theory being the key to the explanation of practical observations, which in turn test the theory. While empirical medicine employs curative methods, the mode of action of which it can not explain, rational medicine endeavors to discover the laws, mechanical and otherwise, that govern structure and function, and to re-establish the conditions that are disturbed by disease. Weak hypotheses and prejudiced notions retard medicine as well as other sciences; if medicine is to develop, it, like other sciences, must employ experimental methods. He recognized and expressed clearly that rational medicine to a large extent is the result of co-ordination of anatomic, physiologic, botanic, chemical and mechanical truths. Hospitals and botanic gardens are necessary for the study of the nature and treatment of diseases. In fatal cases the internal organs should be examined in the end that the causes of disease may be understood and perhaps prevented or modified. He suggests that in many diseases the arrest of increased activity of the morbid cause may be all that can be attained.

Linnæus' interest in the methods of medical education proved of great importance to the study of medicine in Sweden. The course of instruction in the University of Upsala was modified and improved; the requirements for final examinations were raised and their character materially improved. Practical and public examinations in the hospital were introduced. Linnæus' lectures were characterized by clearness, conciseness, ingenuity of classification and direct bearing on practice, and the attendance became very large. Botany was not permitted to crowd out his interest in practical medicine in the widest sense. He wrote popular articles of medical nature, furnished material for almanacs and did much to disseminate useful advice and information. He aided veterinary medicine and helped it to secure recognition in his country. His writings in regard to alcohol unquestionably had some influence in checking the abuse of this substance. It was Linnæus' greatest pleasure to teach the results of his observations and to spread knowledge broadcast. Instruction was his most enjoyable occupation, and he regarded the creation of desire for and pleasure in study as the most important duty of university teachers. He did not hesitate to become the popular exponent of scientific observations, and as such we know he was instructive and inspiring.

THE MEDICAL PHILOSOPHY OF LINNÆUS AND HIS PRINCIPAL MEDICAL WRITINGS.

An interesting phase of Linnæus' work is the extensive correspondence he carried on with learned men and other persons all over the world. Perhaps the most noteworthy correspondence is that with François Boissier de la Croix Sauvages (1706-1767), professor in the medical school of Montpellier; between these two there was carried on a constant and frequent epistolatory exchange of ideas and observations without personal acquaintance. After Boerhaave, Sauvages undoubtedly exercised the greatest influence upon Linnæus' relation to and interest in medicine. Sauvages in 1731 published a work entitled "*Nouvelles Classes des Maladies.*" which became Linnæus' guide in his lectures on nosology. In this work Sauvages, who also had a first love for botany, made the first attempt to arrange diseases *into classes* and species as recommended by Sydenham and Baglivi for medicine. The system and order in

Sauvages' work at once appealed to Linnæus, in whom arrangement was a passion and classification a delight. Later, when Sauvages in 1760 published his great work entitled "*Nosologia methodica sistens morborum classes juxta Sydenhami mentem et botanicorum ordinem*," Linnæus at once introduced it as a text-book for his students. And Linnæus follows Sauvages closely* in his own work on "*Genera Morborum*" (1763), in which the diseases are classified into orders, classes and species. The system is largely symptomatologic. Acute inflammations are referred to fevers and divided into membranous and parenchymatous. Especially the group of *Morbi dolorosi* contains many single symptoms listed as distinct diseases. The group of *Deformes* and *Vitia* which comprise cutaneous affections and tumors, etc., represent definite anatomic forms. Naturally the system corresponds closely with the views prevalent among medical men at that time. There was then no real knowledge of the finer structure of the human body, the relation of diseases to anatomic changes were not understood thoroughly, symptomatology was the phase most actively investigated, and a large fund of therapeutic experience had been gathered. Morgagni's fundamental work in special pathologic anatomy, "*De sedibus et causis morborum*," did not appear until 1762. While Linnæus clearly recognized the importance of pathologic anatomy—he himself made postmortems while in Stockholm, and he subsequently urged their importance—yet his notions of general pathology were governed largely by his views concerning the action and nature of drugs.

MORBI.

Febriles (e sanguine in medullam)		{ Exantematici.	
		{ Critici.	
		{ Phlogistici.	
Temperati	{ Nervini	{ Sensationis Dolorosi.	
		{ Judicii Mentales.	
		{ Motus { Quietales.	
	{ Fluidi	{ Motorii.	
		{ Secretionis { Suppressorii.	
		{ Evacuatorii.	
	{ Solidi	{ Interni Deformes.	
		{ Externi Vitia.	

* Linnæus has 11 classes, 37 orders, 325 species. Sauvages, 10 classes, 44 orders, 314 species.

Exanthematici	Febris cum efflorescentia cutis maculata.
Critici	Febris cum urinae hypostasi lateritia.
Phlogistici	Febris cum pulso duro, dolore topico.
Doloresi	Doloris sensatio.
Mentales	Judicii aberratio.
Quietales	Motus involuntarius.
Motorii	Motus abolitio.
Suppressorii	Meatum impeditio.
Evacuatorii	Fluidorum evacuatio.
Deformes	Solidorum facies mutata.
Vitia	Externa palpabilia.

Linnæus' philosophy of disease is based on the fundamental conception that the human body consists of cortical and medullary (nervous) substances; it is like a woven cloth of double threads, the nerves constituting the warp and enclosing various fibers and fluids, the weft. The medullary substance is of maternal origin and it is the first formed. Further, it is the seat of feeling and motion and the fluid and solid parts arise under its influence. The medullary part in turn is nourished by the finest materials in the cortical parts and by electricity taken in through the lungs from the air. Now, it is disturbance in the normal relations of these parts that cause disease. In fevers, for instance, the fluid cortical part is profoundly altered by acidifying (ab acido seri sanguinis) or decomposing substances that enter the body (a putrido cruoris sanguinis). the fever being critical in the first place and phlogistic in the second. Exanthematous fevers, on the other hand, perhaps depend on living contagium (ab exanthematicis vivis contagiosis). Every inflammation is accompanied by pain because the fibers are stretched to the point of breaking. In order to cure disease the condition of the fluid or solid parts must be changed to the opposite of that under which disease developed. Now, the power of medicines to produce such alterations may be recognized by their taste and smell, and the most important are obtained from plants of opposite smell and taste (sapida and olida). This theory of contraries is the leading thought of all of Linnæus' medical writings, and it constitutes the basis for his classification of materia medica. As seen from the subjacent table, he conceived that there were five kinds of taste and smell, each with its contrary, corresponding to five different pathologic conditions in the two constituent parts of the body. "Linné was the first who saw that nature is balanced by contraries, and acted upon *numero quinario*." He held smell to be due to motion in the

nerves. The idea that the nervous system is distinct and separate from the rest of the body seems to have become necessary in order to arrange medicines in certain large groups because the odoriferous and volatile substances appeared to act directly upon the brain and nerves.

I. SAPIDA.

Agunt in corticale vitale:

	In Fluida.		In Solida.
1. Aquosa	Mundificantia,	Humectantia,	
	Absorbentia,	Exsiccantia,	Sicca.
2. Acida	Refrigerantia,	Attenuantia,	
	Balsamica,	Tonica,	Amara.
3. Dulcia	Edulcorantia,	Impinguntia,	
	Incidentia,	Corrodentia,	Acrida.
4. Viscosa	Inviscantia,	Lubricantia,	
	Penetrantia,	Abstergentia,	Salsa.
5. Pingua	Obtundentia,	Emollientia,	
	Inspissantia,	Adstringentia,	Stiptica.

II. OLIDA.

Agunt in medullare animatum:

Sensum	Excitant	Aromatica	Sopiant	Virosa
Motum	Spasmodic	Argastica	Evacuant	Nauseosa
Judicium	Acuant	Spirituosa	Confundunt	Tetra
Libidinem	Provocant	Ambrosiaca	Suffocant	Airsina

Linnæus' pathology appears to be a compromise between the iatrochemic school—which taught that health depended upon the proper chemical relations of the fluids of the body—and iatromechanic or iatromathematic school—which explained disease according to the laws of mechanics and mathematics applied to the human body. While distinctly influenced by Boerhaave's fibrillar pathology, which sought explanations for disease in the tension and relaxation of fibers (*fibrum strictum et laxum*), which are constituent parts of the body, Linnæus carried this idea much further into details and sought also for corresponding conditions in the fluids. Accordingly, the fibers may be not merely tense or lax, but (a) moist, dry; (b) friable, tough; (c) fat, slender; (d) thick, thin; (e) flexible, stiff. As more or less corresponding conditions in the humors, including the blood, which are the real sources of solid fibers, he enumerates: (a) thin, thick; (b) acid, phlogistic; (c) oily, acrid; (d) plethoric, deficient; (e) glutinous, muriatic. The inter-relations between the fibers and the fluids are well expressed in the following sentence: "Qualis chylus, talis sanguis, qualis sanguis, tales fibræ, quales fibræ, tales oriuntur morbi." A fundamental idea seems to have been that equilibrium in nature depends on a constant struggle between op-

posites. "The human body may be considered as a balance, and when it equilibrates we feel well, but so soon as any overweight appears on either side, then we are sick." His principle of "contrariorum e contrariis curatio" is a further therapeutic application of this theory.

Materia medica was Linnæus' favorite branch in medicine. This naturally was due to the close relationship between pharmacology and botany. In those days botanists generally made incursions into medicine, and it undoubtedly was a source of much satisfaction to Linnæus that he could blend with his teaching of botany the practical part arising out of it, namely, *materia medica*. We know that he strove hard to introduce indigenous drugs into *materia medica* and to establish the cultivation of medicinal and other useful plants. He published a highly estimated *Materia Medica* (1749), which appeared in several editions in Germany. This work is regarded as his most important. The great A. von Haller calls it "commodissimum praelectionibus compendium, inter optima auctoris," and Gronovius and Royen added their compliments. For a long time it remained as a model for other authors. The pharmaceutical plants were arranged according to his botanical system and a careful description given of those drugs used in medicine with a brief statement of their therapeutic value. He endeavored to include only useful drugs and warned strongly against complex formulæ. The empirical classification was abandoned in favor of one based on the general theory that "sapida in fibras, olida in nervos agunt." The chief merit of the work is that by bringing some degree of order and system into this branch he laid the foundation for the scientific study and development of *materia medica*. He was instrumental in introducing into medicine quassia, solanum, dulcamara, and many other substances. Hjelt lays much stress upon Linnæus' effort to establish the nature of poisons which, he urged, give us the best medicines if rightly used.

Another noteworthy book is his "*Clavis Medicinæ*," which contains his fundamental pathologico-therapeutic theories in the most concentrated form. Perhaps this is the most remarkable of all his works because it is a *definite attempt to construct a comprehensive medical*

doctrine upon the basis of certain theoretical conceptions. It certainly is a striking example of Linnæus' ability to co-ordinate and arrange scientific facts of various kinds under one leading idea. Couched in a more or less aphoristic language, it makes rather difficult reading. It is dedicated to Sigfr. Albinus, *Anatomico summo*, Alb. von Haller, *Physiologico summo*, Gerardo Van Swieten, *Observatori summo*, Franc. de Sauvages, *Pathologo summo*, Nicol v. Rosenstein, *Therapeutico summo*.

LINNÆUS' DIETETICS AND HYGIENE.

Linnæus was interested especially in dietetics and hygiene, and his lectures upon this topic were largely attended, and served to create marked professional and popular interest in hygiene, which thus got an early start in Sweden. He mentions six principal requisites for natural life, namely, fresh air, bodily movement, sleep, food, excretions and affections. He attributes hysteria and other morbid conditions among the rich to sedentary life. He explains the effects of air, exercise, etc., according to his general pathologic principles, as is further shown in this table from his "Clavis Medicinæ."

	FLUIDA.		SOLIDA.	
1. Excreta	Densa, Tenuia, Phlogistica, Acidula,	Torrida, Humida, Tenacia, Tenera,	Retenta	2.
3. Motio	Acrida, Acria, Oleosa,	Macra, Pinguis, Gracilia,	Qvis	4.
5. Vigilæ	Pauperata, Plethorica, Muritica, Glutinosa.	Turgida, Rigida, Fluxa,	Somnus	6.
7. Fames			Cibus	8.
9. Frigue			Calor	10.

The application of his general pathologic and therapeutic theories to hygiene is illustrated further by the following statements: Atmosphere influences the body through heat and cold. Cold renders the fibers stiff and the fluids more salty, leading to crystallization and stone formation, while warmth relaxes the fibers and promotes the formation of glutinous material. The softer the fibers the greater the viscosity, the opposite of salty. Motion makes the fluids active, the fibers tenacious, and as the fluids are distributed the parts come closely together. Rest leads to the production of acid and renders the fibers brittle. Sleep leads to fat in the solid parts and makes the fluids oily; hunger

and waking makes the fibers thin and the fluids sharp, hence the best remedy for fat is waking. Excessive evacuations render the fluids thicker and fibers dry, bodily enfeeblement and emaciation resulting, while retention renders the solid parts moist and the fluids thin.

LINNÆUS' ETIOLOGIC THEORIES.

Linnaeus paid especial attention to the question of etiology of disease. He regarded the cause as of fundamental significance in determining the kind of disease in a given case. Like the old physicians, he divided causes into proximal and remote, and according to his theory the proximal cause lay in changed tension of the solid parts or in altered mixture of the fluids, while the remote causes might be found in diet, age, bodily constitution, or in contagion.

Perhaps the most remarkable of Linnaeus' various medical theories is the one concerning "exanthemata viva," or that contagious diseases depend upon the entrance of small living animals into the body. This assumption he regards as fully warranted, both in analogy and experience. Of such diseases he mentions scabies, epidemic dysentery (scabies intestinorum interna), pertussis, smallpox, pest; later leprosy, phthisis pulmonum and the malarial fevers were added to this category. While the small animals Linnaeus had in mind had not yet been seen or described, he saw in the manner of the spread of infectious diseases a remarkable similarity to the mode of reproduction and increase of many animals, especially insects. The smaller an animal the more numerous and rapid its progeny, hence it is not difficult to conceive that some of these minute organisms by their excessively rapid multiplication may in a short time totally fill, as it were, the whole human body. As an illustration of this fact he cites the inoculation of smallpox, in which the quantity of pus used is of no import in securing the development of good pustules. That the contagious element is destroyed by cold, but multiplies in warmth is cited as another evidence of the parasitic origin of contagious diseases. Ustilago is cited as analogous to the contagious element. The drugs that destroy insects of various kinds—musk, camphor, mercurials, sulphur, etc.—were useful also *in contagious diseases*.

Linnæus always felt much interest in intermittent fever, which was endemic about Upsala at the time of his first arrival, and which formed the subject of his inaugural dissertation in Holland in 1735. He himself became a sufferer from this disease at the end of his sojourn in Holland. In Sweden intermittent fever occurred in clayey districts, and Linnæus first advanced the notion that particles of clay dissolved in water entered the blood and by arrest in the finer vessels interfered with cutaneous transportation. Later this theory of waterborne malaria was modified very much, and the disease was attributed to absorption by the skin of foul particles in the air, namely, miasms from quiescent waters, closed cellars, graves, decomposing animal and vegetable materials. Air, he urged, must contain some form of acid because vegetable and animal tissues and fluids become sour under its influence. Now, is it not possible that intermittent fever is caused by a coagulation of the serous part of the blood under the influence of "*animalcula infinite parva*" in the atmosphere which carry this acidifying substance. In further support of this theory he mentions the endemic occurrence of the disease in moist places with clayey soil and foggy atmosphere; the frequency with which it affects persons living on the ground floor or in cold, foggy places; the sour sweats of malarial patients, and the fact that bitter drugs, such as cinchona, which generally diminish acidity in the body, are the most useful in malarial diseases. Consumption, he believed, was caused by the inhalation of fine particles in the air which is permeated by minute floating substances of diverse kinds; this he illustrated by referring to the frequency of "*tussis calculosa*" among the stone-cutters in Orsa. Dalarne. He frequently makes mention of the contagiousness of tuberculosis. As an especially efficient treatment of incipient tuberculosis horseback riding is urged.

MISCELLANEOUS INVESTIGATIONS AND OBSERVATIONS.

In 1746-47 and 1754-55 he was engaged especially in studying a peculiar disease then appearing in the southern parts of Sweden (*dragsjukan*). His observations were summarized as follows: The disease attacks only the lower classes, but children never; it occurs only in the autumn and may show itself in domestic animals

also; it lasts for two or three months, generally attacking several persons in the same household, but nevertheless it is not contagious. He concluded that the disease, which we now know as ergotism, is due to the use of freshly gathered corn; and as it occurred mostly after wet summers, when weeds abounded, he assigned the real cause to the weed predominating in the fields, namely, *Raphanus raphanistrum* (jointed charlock or black radish), and suggested the name raphania. The disease was known under this term until the correct name arose from a more exact knowledge of its etiology.

Much of Linnæus' work is contained in dissertations by his pupils and many of them were enlarged transcriptions of lectures. A collection was made in a series of ten volumes,* of which seven are by Linnæus and three by Schreber and Erlangen. Pulteney gives an abstract of those by Linnæus' students.

Linnæus emphasized much the diagnostic and prognostic importance of the pulse. Actual knowledge of circulatory diseases seems to have been well advanced at that time, because we find he attributes irregular pulse to any of the following conditions: inflammation of the heart; dilatation of its muscle; aneurisms; tumors, polypi and abscesses of the heart; inflammation of the valves; obliteration of the pericardial cavity and other lesions of the pericardium; irregular action of the cardiac nerves. Further, it may depend on paralysis or spasm of the vessels, inflammatory stasis, ossification of the arteries, aneurisms and polypoid concretions. Finally, the cause may be in the blood itself.

It is of much interest to note that Linnæus suggested that fibrinous polypi within the vessels may be loosened and cause death from sudden suffocation. In other words, he recognized fairly well the mechanism of pulmonary embolism.

Linnæus distinguished correctly between cerebral hemorrhage and congestion. His description of hemi-crania is excellent, being himself a sufferer from this affection. In 1742 he described well a typical case of aphasia under the title of "Failure to remember substantives, especially names" (*Glömska af alla substan-*

* *Amoenitates academicæ seu Dissertationes variæ Physicæ, Medicæ, Botaniciæ, etc.* G. Dubois, 1748.

tiva och isynnerhet namn). Matthew Baillie described aphasia first in English, and that was in 1806.

His study of the gadfly of the reindeer—*Æstrus tarandi*—during a journey of scientific exploration into Lapland while still a youth, is an excellent example of power of observation and of accurate and decisive description. In the first place the fly is described accurately, as is the method of disposition of the eggs on the skin by means of the tail. Then he shows that the gnats penetrate the skin at a time when the horns are in the velvet and so soft that the pests can not be driven away, the entire series of events as well as the intricate mechanisms brought into play being ascribed to the ingenious arrangement of an all-wise Creator. Even then he studied carefully sickness among men and animals.

Rosén and Linnæus made many important observations concerning parasitic worms; among those described is *Tenia solium* (Linné, 1756). He taught that tenia had no head and that it might grow ad infinitum.

CONCLUSIONS.

In terminating this fragmentary sketch of a small part of the work of Linnæus it seems to me that he is fully entitled to a place among the founders of the scientific school of medicine whose object it is to understand the nature of disease and to find and remove the causes of disease. The underlying principles, the scope and the results of his teachings and his labors entitle him to this distinction. At the same time as his predominating influence on the study of natural science in general, both directly, especially in Sweden, and indirectly advanced the scientific study of medicine, he himself and his pupils made distinct and permanent additions to our knowledge of diseases. He fully recognized and urged the importance of theoretic investigation in medicine, unprejudiced observation at the bedside, anatomical inquiry and rational therapy. Finally, he saw glimpses of great etiologic truths in regard to infectious diseases at a time when the great and populous microscopic world was indeed a "mundus invisibilis."

APPENDIX.

Linnæus' one foible according to the standards of to-day was love of fame and this frailty is freely exposed in his diary, the part of which concerning medicine is

transcribed as translated from the Swedish manuscript in Pulteney's work, second edition, edited by Maton:

Linnæus practiced physic at Stockholm from 1739 to 1741; he was physician to the great naval hospital there, and had, besides, as much practice as all the other physicians collectively; but, on being made Professor, he relinquished the whole of it, because either that or his duties as a Professor must otherwise have been neglected. From this period, therefore, he attended only his friends and the poor.

Physiology derived from him an important discovery, namely, *Generationem ambigenam*. Harvey maintained that the rudimentum futuri fœtus lies in ovi puncto saliente; Leeuwenhoek, that it lies in genituræ verminulus spermaticis; Linné, on the other hand, that from the mother comes Carina Malpighii, rudimentum encephali, and from the father punctum saliens cordis, et inde totum corpus. This he proved by observations on hybrid animals, hybrid plants, etc. Thus, sense and temper, with tenaciousness of life, proceeded from the mother, but external appearance and habit, with strength of constitution, from the father. The Medulla spinalis would grow in infinitum if it were not confined by the spina dorsi tandem ossificata in pubertate; et a retropressione libido. The contrary happens in Tæniæ, and in vegetables which have no bone in their composition. Ossea crusta will grow infinitum, cæteris paribus. The object of respiration, he thought, is to extract the electric fluid from the air by the lungs and thus to transmit it to the medulla, becoming the spiritus animalis, as it were; and hence, that the chief office of the lungs is not to accelerate the motion of the blood. Some foreigner has considered this as an hypothesis only, but Linnæus as an axiom.

Pathology is a subject on which he corresponded more than thirty years with the learned Sauvages, above one hundred of whose letters are in his hands.

Genera Morborum have not been so clearly defined by any one; there is not a single word in them that is not useful; his work on this subject is an excellent compend for a tyro. He has divided fevers into three classes, after a method entirely his own: Exanthematicæ, typo scabiei, ad exanthematibus vivis contagiosis; Criticæ, typo rheumatis (Fluss), ab acido seri sanguinis; Phlogisticæ, typo inflammatorio, a putrido cruoris sanguinis.

He was the first to explain that Tænia had no head and grows infinitum, and also that fragments of this creature sprout again.

That Lepra is caused by a species of Gordius, found principally in herrings, has since been confirmed by the Norwegians.

To show that *Raphania* is occasioned by the *Raphanistrum* required his thorough acquaintance with natural history.

He maintained that *Scorbutus* is caused by culinary salt.

Diet nobody has treated of in a more solid and satisfactory manner, though he did not publish anything on the subject. His doctrines, like those of the later natural philosophers, are deduced from experience, and his system, like theirs, may therefore be called experimental. Everything was deduced from occurrences in common life, cited in their proper places as examples, on which account his auditors were never more numerous than when he lectured on this subject. Several persons took notes at these lectures, but all the notes I have seen are incorrect.

Pathology, the foundation of the whole medical art and of all medical theory, has been more improved by Linnæus, in his *Clavus Medicinæ* of eight pages (which is a masterpiece in its way and one of the greatest treasures in medicine) than by a hundred authors and books in folio.

The Mechanical Physicians, indeed, had shown that the action of the *Sapida* consists in relaxing or constringing, according to the nature of their taste; but neither the species *saporis*, nor their contraries were explained—much less the nature of the *Olida*. Linné was the first who saw that nature is balanced by contraries, and acted upon numero quinario. He saw that the Creator had given to animals two senses, viz., taste and smell.

That the *Sapida* act only on the fluids and solids, or on the fibers.

That the *Odora* act only on the brain and nerves.

He found that *Vitia Corpora*, as well in the fluids as the solids, are only five in number.

That the *Vitia Encephali*, vel *Systematis Nervosi* are likewise five; each with the same number of contraries.

He likewise found that the *Sapida* and *Odora* are also five, with as many contraries, and that the right indication results from a comparison of contraries with contraries. He proved this by examples. What can be stronger?

For this was required all the knowledge that Linnæus possessed of diet, natural history, medicine, *materia medica*. Few physicians had been conversant with all these branches together. Fortunate were those students who, before his time, could acquire this knowledge.

Not to mention that Linnæus was the first who said that all our principal medicines are poisons; that physicians ought not to condemn poisons, but to use them, as surgeons their knives, cautiously.

The *Materia Medica* likewise was in a confused state, and many articles were imperfectly known until Linnæus reformed

1. He introduced the genus specific difference, select synonymous pieces of growth, cultivation, deduced their medicinal effects, and uses from the impressions they produce on the organs of taste and smell, and lastly described the several compositions, all of which had been either continued or superficially treated of before, but by Linnaeus were distinctly explained in his materia medica.

He was the first person who determined *Saccharula*, Balsam of Tolu passed. He introduced several new articles: revived the use of others which had been forgotten: *Agathosmia*, *Fungus Medicatus*, *Senega*.

Dulcamara. Linnaeus was the first who brought this plant into general use in Sweden. He cured *Synocha* and *Scorbutus* with it. *Toga* scorbuto summa officia, quam minus generis remedia frusta essent videnda, eiusque gratia ad summum pervenisset. Methodo Balconi, omnia Sarvagasi, cum perfecte curant, sed non bene Dulcamara, quod remedium Sarvagis ad hoc Linnaei adieperit. Dulcamara bene: nullus synochae curat Sarvagis igitur non i Linnaei abiecit.

Sarvagasin plantae agra locum illis agum, in eis legere locum, curat Linnaei infus sarvagasinum, in ipse in literis facit, cum legere videtur bene.

Scorbut. He was the first person who taught that it was the most specific against the venereal taint.

Agathos. He was the first who introduced it for the cure of cutaneous diseases, and is a preservative or expellent against the principal febrile contagion in exanthematicus diseases.

A *Scorbuto* *Scorbut* *Agathos* plantae applied to ulcers, in that sense he was first informed of from America, and by him it was communicated to Europeans.

Dulcamara powder is inserted in the *Phorus* *Phorus* *Phorus*.

Agathos powder against cancer *Phorus* *Phorus* *Phorus*.

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